



**Northwest and
Alaska Fisheries
Center**

**National Marine
Fisheries Service**

U.S. DEPARTMENT OF COMMERCE

NWAFRC PROCESSED REPORT 86-11

FINAL REPORT

**Get the Drift
and Bag it**

April 1986

I N T R O D U C T I O N

This paper summarizes the organization, implementation and result of a volunteer effort to inventory the marine debris found on the coastal beaches of the states of Washington, Oregon, California, Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island. The cleanups were conducted between September 21 and October 12, 1985.

The purpose of the cleanups was to document, in a general way, the type and quantity of marine debris and its probable source. Further, it was an attempt to determine whether sport and commercial fishing gear is a substantial contribution to marine debris in those specific states.

In addition to the states identified as study areas, cleanups were conducted in Hawaii, New Jersey, and Louisiana. The results from those cleanups are also included in this report.

B A C K G R O U N D

An article by freelance writer Tom Paul in the May-June 1984 Alaska Fish and Game Magazine was the seed for an idea which resulted in the beach cleanups covered in this report. Entitled the PLAGUE OF PLASTICS, it discussed the increasing proliferation of plastic debris into the natural environment and the resulting ingestion and entanglement by fish and wildlife.

I am an employee of the Oregon Department of Fish and Wildlife and read the article when it was delivered to my office by mistake. I was surprised to learn that plastic is mistaken for food by birds and turtles. I have been a birdwatcher for over 25 years. I knew birds get entangled in monofilament fishing line and six-pack rings, but I did not know they have an appetite for styrofoam and small bits of plastic.

In talking to other birdwatchers, scientists, and the general public, I realized other people were also unaware of the problem. Since 1984 had been declared the "Year of the Ocean" by the federal government and a non-profit organization by the name of "Coastweek" had a variety of activities planned around the country, I had the idea to organize a cleanup of plastic debris on Oregon's 350 miles of coast.

On October 13, 1984, a very cold, wet, blustery day, some 2100 volunteers collected 26.3 tons of marine debris in just three hours. They filled out and returned 1600 questionnaires which documented the quantity of fishing gear, six-pack rings, styrofoam, plastic bags and

bottles, rope, and strapping bands. There were ten people for every mile of the approximately 150 miles of accessible beach.

Word of the cleanup spread quickly and in November 1984 I was invited to report the results at the Workshop on the Fate and Impact of Marine Debris sponsored by the National Marine Fisheries Service and held in Honolulu, Hawaii. Those attending represented governmental agencies with scientists who had an interest in the marine mammal entanglement problem or who were working on research projects related to entanglement.

There were a number of recommendations which came out of the Workshop, and one of them was that beach cleanups are a valid way to document the amount and types of marine debris. As a result of attending the Workshop, I was asked to report on the findings of 1985 cleanups held along the West Coast and New England Coast. What follows is a summary of how this task was accomplished.

Judie Neilson
National Coordinator
Get the Drift and Bag It

GET THE DRIFT AND BAG IT -- 1 9 8 5

On June 3, 1985, a "Dear Coastal Colleague" letter was mailed to over 200 organizations and government entities listed in the National Wildlife Federation Conservation Directory. Those identified were felt to have some relation to being involved in coastal issues. They were asked to take an active part in organizing a beach cleanup in the study area states or send the name of a person within the study area to contact. Firm commitments to be involved were received from eight states.

Respondents were mailed a copy of the Nuts and Bolts Guide to Organizing a Beach Cleanup Campaign the Easy Way (APPENDIX I) and other background information prepared by the Oregon Department of Fish and Wildlife during the first cleanup held in Oregon in 1984. The material was specifically geared at entanglement and ingestion issues and did not address marine debris as litter.

Each state was encouraged to use special creativity to organize the cleanup to respond to local conditions most effectively. The cleanups were patterned after Oregon's 1984 program, but there were special differences. Many states have little publicly owned beach, others have steep banks making foot access difficult or impossible. Liability was a valid concern in many locations.

The main focus of the national cleanup was to determine the amount of derelict fishing gear, both sport and commercial, which makes its way to the coastal beaches and how that impacts fish and wildlife species.

R E S U L T S

Following each individual state cleanup, the National Coordinator contacted the State Coordinator to review events and receive information about what was collected. Those reports, by state, follow.

CALIFORNIA

Joan North, an executive intern with the California Department of Fish and Game, served as State Coordinator. She was assigned to the executive staff of the Department in July, but in the two and a half short months prior to their September 21 cleanup, was able to engage the interest and services of a broad array of government, industry, and private organization personnel and volunteers.

The 1500-1600 individuals who volunteered were able to cover 300 miles of California's 1100 mile coastline. They collected 89 tons of debris in three hours.

In addition to the dedication and fulltime attention of the State Coordinator to the cleanup, much of their success is the result of the strong commitment from the Department of Fish and Game in sponsoring the event.

While the primary purpose of the cleanup was to focus attention on the danger to wildlife of carelessly discarded debris, California sought to attract groups with a variety of perspectives and opened the campaign to any individual or organization interested in

preserving the beauty, value and safety of California's beaches. They focused on all trash, not just plastics. They involved representatives from the California Coastal Commission, the California Waste Management Board, California Conservation Corps, and Californians Against Waste, who served as co-sponsors.

The planning committee with representatives from those entities determined the appropriate beaches to be cleaned, helped to recruit zone coordinators in each coastal county, assisted with the public relations, chose a theme and motto of "California Coastal Cleanup Day" as a kickoff to Coastweek proclaimed for September 21-28, and sought endorsements.

All groups contacted were supportive of the Cleanup Day concept, and many particularly liked the idea of the total west coast cleanup. The late notification, with only two months to plan, was an obstacle, since many groups plan a year in advance. Those who did participate, and those who lacked sufficient lead time to be involved, indicated an interest in helping in 1986.

Approximately 30% of the volunteers returned questionnaires. Their responses were projected statewide to provide demographic information with the following breakdown of participants:

| | | | |
|--------|--------|----------------|----------|
| Male | -- 60% | Under 18 years | -- 18.4% |
| Female | -- 40% | 18-40 | -- 58.6% |
| | | Over 40 | -- 23.0% |

| | |
|------------------------|----------|
| Affiliated with Groups | -- 54.4% |
| Concerned Citizens | -- 45.6% |

Although there was almost no publicity in noncoastal cities, inland city residents comprised close to 15% of the participants.

The volunteers' questionnaires listed the types of debris collected, and the 30% returned were used as representative of the entire cleanup. They showed that California's biggest trash volume problem is bottles and glass, closely followed by styrofoam. Because styrofoam is lightweight, its weight does not denote the problem as well as its volume. The amount and category follows:

- | | |
|---------|--|
| 50 Tons | Glass and bottles (mainly beer and wine bottles, a lot of hazardous broken glass) |
| 5 Tons | Styrofoam (fast-food containers, coffee cups, packaging material, inexpensive ice chests) |
| 10 Tons | Paper (newspaper, paper bags, cold drink cups, toilet paper, kleenex, boxes and packaging, cigarette packs) |
| 1 Ton | Aluminum cans (beer and soft drink cans) (These seem to be less of a problem as they are lightweight and often picked up for sale to recyclers.) |
| 20 Tons | Other (Lots of heavy items including shoes, buckets, tires, concrete, broken surfboards, flashlights, lawn chairs, carpeting, metal pipe, auto parts, rifle shells, hubcaps, lobster traps, and disposable diapers, coat hangers, toys, clothing, bottle caps, straws, etc.) |
| 3 Tons | Six-pack holders (4,500) Plastic containers - about 6,000 pieces (detergent bottles, sunscreen bottles, film cans, juice containers, many plastic bags and bait bags) Fishing line - about 930 pieces of varying lengths Plastic net and strapping - about 200 of various sizes |

Much of the debris was picnic-related and on the north coast, fishing-related. There was evidence of washed up trash all along the coast. The biggest problem identified by volunteers was the dearth of rubbish receptacles on beaches.

California's coordinator concluded that the Cleanup Day "provides an opportunity to bring disparate groups together with a common objective, whether their motivation stems from an interest in wildlife protection, from a desire to enhance recreational sites, or from aesthetic concerns. Information about the nature and volume of debris is compiled, permitting elected officials to make informed decisions concerning recreational, environmental, waste management issues. The Department of Fish and Game may use the cleanup to educate the public about the increasing danger to wildlife from plastic materials, fishing line and netting. Few of those who toss debris overboard from commercial or recreational boats, or leave it at their picnic sites rather than haul it home or to a rubbish container, are aware that it poses a threat to ocean mammals, birds, and other wildlife."

She further commented, "the cleanup also draws attention to the serious waste management problems facing California and the nation and highlights the need to educate the public regarding biodegradable material, recycling and trash disposal."

A complete copy of a report on California Coastal Cleanup Day is available from the Department of Fish and Game, 1416 -9th Street, Sacramento, California 95814.

CONNECTICUT

Meg Goodwin, the Oceanic Society, at Stamford, was the State Coordinator for Connecticut. Their cleanup was held on Saturday, September 21.

Of their 70 miles of coastline, only five miles was covered by 15 volunteers. They had excellent media coverage prior to the cleanup, but because most of Connecticut's coastline is privately owned, they had a difficult time gaining access or attracting a large number of participants.

The volunteers filled 35 -10 gallon sacks. The coordinator estimated they collected a total of 300 pounds. They did not encounter much fishing gear or netting. The majority of their debris was styro-foam food containers, plastic straws, pieces of rope, and household items.

Connecticut is interested in having a cleanup in 1986.

MAINE

Kate Wynn, research associate with the University of Maine at Orono, was the State Coordinator for Maine. Their cleanup was held on October 6 as a part of COASTWEEK activities.

The State Coordinator speculated that debris was different from what would normally be found in October because Hurricane Gloria had devastated the New England coastline two weeks prior to the cleanup. Lightweight material, such as styrofoam, had blown inland. Other debris, such as plastic bags, rope, and strapping bands, was rolled up in the rock weed in a tangle. This made the collection of debris very difficult.

Maine has approximately 3,500 miles of coastline. The cleanup attracted 363 volunteers who covered 30 miles and collected 1,560 pounds of debris. The State Coordinator estimates that if the same ratio of volunteers per mile covered the entire coast, they would have collected

92 tons of debris. As it was, they averaged 52.7 pounds of debris per mile.

There appeared to be no trend in the type of marine debris found in either the large populated areas or in small fishing villages. There seemed to be a larger amount of shore based debris, but this was not specifically documented.

The Gulf of Maine is heavily used and most of the debris found in Maine is generated in the Gulf waters rather than further offshore. Some debris was of Canadian origin.

The breakdown on statistics for Maine follow:

| | | | |
|-------------------------|------|-------|------------------|
| Number of Participants | 368 | 71.2% | 0-18 years old |
| | | 21.1 | 19-40 |
| | | 7.6 | 41+ |
| Number of Miles Covered | 19.6 | 51.7% | Sand/Shell Beach |
| | | 36.8 | Rocky Beach |
| | | 7.4 | Estaurine Shore |
| | | 4.1 | Boulder Headland |

Areas Involved - 27 from Kennebunk to Eastport

Number of Pounds Collected - 1560 Total - Average 52.7 pounds per mile.

Number of Pieces Collected - 13,000 Approximate (conservative)

Composition of Debris, based on number of pieces by category:

| Rank | Debris Category | #Pieces | Percent of Total |
|------|-------------------------|---------|------------------|
| 1 | Glass pieces/bottles | 4126 | 31.4 |
| 2 | Styrofoam | 1518* | 11.6 |
| 3 | Household Items/Clothes | 1469 | 11.2 |
| 4 | Plastic Sheeting, Bags | 1377 | 10.5 |
| 5 | Cigarette Butts | 1364 | 10.5 |
| 6 | Fishing Gear | 1098 | 8.4* |
| 7 | Cans (tin, aluminum) | 1078 | 8.2 |
| 8 | Plastic Containers | 806 | 6.1 |
| 9 | Plastic Strapping | 191 | 1.4 |
| 10 | Six-Pack Rings | 76 | 0.6 |

*Percentage of styrofoam and fishing gear may be low. Pieces of styrofoam buoys were apparently alternately categorized as fishing gear or styrofoam by different people.

The State Coordinator for Maine concluded that more litter barrels are needed along the beach to give people a place to dispose of beach-oriented debris. Certain beaches are apparently used as dump sites for land based household garbage. Tampon applicators were especially numerous in the southern part of the state.

The State Coordinator plans to adopt specific one mile stretches of Maine shoreline for ongoing, perhaps monthly, pickups to determine the amount of marine debris accumulating during different times of year. This will be a joint project with the State Coordinator in Massachusetts.

MASSACHUSETTS

Tracey P. McKenzie, a biologist for the National Marine Fisheries Service Management Division at Gloucester was the State Coordinator. She had heard about Oregon's 1984 cleanup and contacted Judie Neilson by telephone in August to offer her services. Greenpeace New England in Boston had been contacted previously, but they decided to take a supportive rather than leadership role because they were involved in active fundraising.

The Massachusetts Department of Fisheries and Wildlife was a major sponsor of the event. The Massachusetts cleanup was held on October 12 to coincide with COASTWEEK activities. Approximately 30 miles (nine miles of ocean beach) of the 1200 mile coastline was covered by approximately 500 volunteers. They collected 2.5 tons of debris.

There was a noticeable difference between debris which drifted ashore and that which was left from beach use. Beaches exposed

to the ocean generally accumulated plastic jugs (small and large), oil cans and drums, styrofoam, plastic bags and sheeting, polyurethane foam, and fishing gear such as monofilament, lobster buoys, trap bags and pots, and components of bottom trawl gear. Variability existed along beaches exposed to bays and harbors. Those beaches closer to well-developed and high use areas, picnic areas, and marinas accumulated more aluminum food wrappers, plastic and styrofoam eating utensils, clothes, toys, glass bottles, plastic containers, bags and sheeting, and aluminum and tin cans. Plastic bags and sheeting and plastic tampon applicators were abundant on at least 95% of the beaches surveyed.

The preliminary results from South Shore, Swansea, and Cape Cod litter cleanup and survey follow:

Miles covered - 30 (9 ocean and 21 bay/harbor)

Type of Beach:

| | |
|-----------------------|---------|
| Rocky/sandy | 5 miles |
| Rocky/sandy/estuarine | 4 |
| Sandy | 11 |

| | |
|-------------------------------|--------------------------------------|
| Total Sites: | 20 (No data available on four sites) |
| Exposed to Cape Cod/Mass. Bay | 12 |
| Exposed to Nantucket Sound | 1 |
| Exposed to Atlantic Ocean | 7 |

| | |
|--------------|---|
| Total Pieces | 15,000 - 16,000 as listed by category. Does not include items listed in "other" which were not tallied. Estimates are conservative. |
|--------------|---|

| | |
|---------------------|--------------------------------|
| Total Fishing Gear | 850 (included in total pieces) |
| Percent Beach Use | 37% |
| Percent Ocean Drift | 63% |

The 1971 Corps of Engineers National Shoreline Study for New England lists 1,200 miles of coast along Massachusetts. 800 miles are private, 85 are

industrial (marinas, piers, etc.), 80 are not inhabited, and 235 are available for public use and access. Using the estimate of 30 miles surveyed on Cape Cod and eight miles on Cape Ann, Massachusetts citizens covered about 16% of the public access or use beaches.

The State Coordinator expects to have a cleanup in 1986. Her full report is available by writing to National Marine Fisheries Service, Northeast Region, State Fish Pier, Gloucester, MA 01930.

NEW HAMPSHIRE

Jane Doughty, Seacoast Anti-Pollution League in Portsmouth, was the State Coordinator for New Hampshire. The cleanup was held on October 6 as part of the COASTWEEK program.

With only twelve miles of coastline and very little access, the cleanup attracted fifteen people who cleaned four miles. A total of 200 pounds of marine debris was collected. No breakdown by category or specifics on the type of debris found was forwarded for this report.

OREGON

Judie Neilson of the Oregon Department of Fish and Wildlife and Linda Shuee, a volunteer, were the state coordinators for Oregon. Oregon was fortunate to have an established network of zone captains, sponsors, refuse haulers, media contacts, and volunteers from the first cleanup held in 1984. In early 1985, Neilson and Schuee authored a "Nuts and Bolts Guide for Organizing a Beach Cleanup Campaign the Easy Way". Copies of that booklet, posters, zone captain maps, and results of the 1984 cleanup are available by writing directly to the Oregon Department of Fish and Wildlife, PO Box 59, Portland, OR 97207.

The 1984 organizers indicated a willingness to be involved again in 1985 and they had the experience of knowing which systems for organizing worked and which did not. They had established pickup and collection sites, a good rapport with the local community and refuse collectors, were on a familiar base with local news media, and had participated in the celebration parties.

In 1984, Oregon had 2100 volunteers who collected 26.3 tons of debris. The 1985 cleanup attracted 2300 volunteers who filled 2800 sacks, but the debris weighed only 25.5 tons. This was probably due to there having been no severe winter storms and the sand attached to the debris was relatively dry. When it was put into the 20-gallon collection sacks, most of the sand dropped off. Of the 2300 volunteers, 1450 returned questionnaires to the State Coordinator. The tabulation of those cards is attached to this report as APPENDIX II.

The 1985 cleanup could be characterized as a rubber stamp of the 1984 project. The date for the 1985 cleanup was moved ahead three weeks to avoid the onslaught of winter storms and to join forces with an inland litter cleanup campaign, "Bag It Days" organized by the Stop Oregon Litter and Vandalism organization.

On September 21, 1985, the weather was warm and sunny on the central and south coast and windy and foggy on the north coast. The prevailing winds had not yet shifted so most debris was covered with a light layer of sand. This made the collection of debris more time consuming.

The majority of the material collected was styrofoam. An analysis of the pieces found indicates most of it was broken off of items like flotation blocks rather than coming from food containers or ice chests. Like the State of Washington, Oregonians noted small bait bags near the mouth of the Columbia River on the north coast. The size indicated they had contained a dozen herring as used by fishermen after salmon on the charterboat fleet.

A sample of both trawl net webbing and monofilament gillnet webbing was given to each zone captain. The samples were shown to all volunteers during the briefing session held by each zone captain. Volunteers were asked to note those two categories of fishing gear on the questionnaires distributed. They were also asked to note their estimate of sport fishing gear such as monofilament line, hooks, etc.

The only reports of large pieces of net in 1985 was one large seventy foot long section of trawl net at Newport on the central Oregon coast, a large monofilament gillnet near the mouth of the Coos River near Coos Bay, and some gillnet fragments on the south coast near Gold Beach. At the Gold Beach location, they also reported gillnet floats and small pieces of trawl net. The area adjacent to Coos Bay on the south central coast also experienced large numbers of herring bait plastic bags.

On dead gull was found at Reedsport with a monofilament line wound around it and two large salmon mooching hooks attached.

The date for the 1986 autumn cleanup has been set in Oregon for September 20 to coincide with COASTWEEK. A pilot project is

planned for April 19 to determine what type of marine debris is found on the Oregon Coast following the change in the currents during March. The spring cleanup will not be coastwide or very structured.

Also, the State Coordinator is attempting to identify at least ten individuals who are willing to "adopt a mile" of coast and inventory the debris at least monthly for a year.

Most of the volunteers and zone captains have again indicated a strong interest in staying involved. The State Coordinator meets monthly with the organizers of "Bag It Days" campaign and the "Get the Drift" cleanup will be the kickoff event of the statewide cleanup effort which lasts for a week.

Because 1985 was Oregon's second year, there has been a drastic increase in the number of organized groups who are putting together their own work parties, chartering transportation, and planning their own celebration potlucks after the cleanup. This will be an aid in having continuity and more sophistication in the reporting aspects of the cleanup. It will also help publicize the cleanup in advance through club newsletters and word of mouth.

RHODE ISLAND

Eugenia Marks, a member of the Audubon Society of Rhode Island was the State Coordinator as a result of receiving the "Dear Coastal Colleague" letter in June. The Rhode Island cleanup was held on September 21 and was patterned after Oregon's 1984 project.

Questionnaires were returned by 13 of the 32 coordinators. A total of 287 volunteers covered 48 miles of the coastline and filled 350 large garbage sacks totaling approximately 5,400 pounds.

There are not specific numbers of pieces by category for this cleanup. Comments about the debris specifically mentioned the presence of tampon applicators and whether they might be generated by pleasure boat disposal systems. There was also concern about the amount of polypropylene line, beer cans, lobster pot buoys, rope, disposable diapers, and the need for more refuse containers on the beach.

Reports noted the collection of a reasonable amount of fishing line or other fishing industry debris, but the quantities of these materials was not enumerated.

Many volunteers indicated an interest and willingness to participate actively next year.

The total expense for the Rhode Island cleanup was \$1,018.30, with most of that being for the 310 T-shirts given to volunteers. Donations in the amount of \$494.00 were received, leaving an expense of \$524.00 to the Audubon Society. The garbage bags and disposal fees were all donated, along with food to feed the volunteers.

WASHINGTON

Leighton Pratt, Washington Department of Ecology, was the State Coordinator. The Department became involved at the request of

Jefferson County Commissioner John Pitts. Commissioner Pitts read about Oregon's 1984 cleanup and contacted the National Coordinator for more details. As a coastal county veterinarian, Commissioner Pitts had been asked to treat birds who became entangled in marine debris. He was interested in learning what kind of debris is found on the Washington state beaches and what could be done about reducing it.

The Department of Ecology is responsible for litter control in Washington and had worked with four wheel drive organizations for twelve years on coastal cleanups. Normally, their program, "Operation Shore Patrol" was held soon after Memorial Day to clear the beaches of summer's accumulated trash. Washington has a treacherous coastline and restricted access because of ownership configurations. The four wheel drive groups were identified as a source of help.

The safety of volunteers was of utmost concern. In Washington, no general call for volunteers was made. Those who participated belonged to organized four wheel drive associations or groups with alpine hiking skills.

A large portion of the coastline is owned by the Quinault Indians and special arrangements were made for access to beaches within the reservation.

September 21 was chosen as the date for Washington's cleanup to coincide with Oregon and California cleanups and because low tides would expose more beach area.

A specific breakdown by category of debris was not available from the Washington cleanup. Since it was their first year, they decided to concentrate on the organizational aspects and try to establish a system for future cleanups rather than being precise about what was collected.

The following highlights minutes taken at a recap meeting of the cleanup committee in October:

On the north coastal strip, more than 18 groups were involved, including 164 individuals plus 30-40 US Park Service employees. Two helicopters picked up 692 large Department of Transportation litter bags, nine oil drums, and a wide variety of material normally associated with beach drift. The Department of Natural Resources provided seven trucks, the US Park Service provided four trucks, and private refuse haulers provided help by moving dumpsters and waiving disposal fees.

One minor injury was reported when a young woman tripped over a log and twisted her knee and ankle. There was a concern about mixing helicopters and people in the same areas. It was suggested the debris pickup might be done the following day to avoid conflicts. In addition, cargo nets should be distributed at various sites before people arrive because they are too heavy for volunteers to carry them into the cleanup sites.

Four suggestions for next year in Washington were made:

1. Recruit more people; could have used twice as many;
2. Use private helicopters rather than military aircraft;
3. Plan some type of wrapup celebration; and
4. Have better radio communication among workers.

There was a discussion also about expanding the cleanup to include Puget Sound under controlled conditions. Puget Sound may also be more appropriately cleaned up during the four wheel drive Spring Rally cleanup held each April.

In the Moclips to Ocean Shores area, more than 128 people filled over 900 Department of Transportation large litter bags. The local Lions Club provided lunch and breakfast for the volunteers. Governor Booth Gardner joined the Pacific Northwest Four Wheel Drive groups at their registration area for a brief time.

At the Twin Harbors area, more than 350 four wheelers and local volunteers filled 1300 large litter bags. The City of Westport rolled out the welcome mat, including a parade and Mayor Harold Hardy met with Governor Gardner at the state park.

On the Long Beach Peninsula, 178 four wheelers plus local citizens participated in the cleanup and filled more than 750 large bags.

It was apparent that better communications early in the planning stage between four wheel drive clubs, local business interests and local officials creates a more positive activity for everyone. This year the Washington State Parks rangers were heavily involved in the cleanup and were instrumental in its success.

The survey form comments were pretty much as expected but two things were prominent:

- (1) Plastic bags were found in vast numbers on the southern

beaches. The Washington Department of Ecology will work with Grays Harbor and Pacific County officials, local charter boat associations and businesses selling bait to develop a public awareness campaign concerning the proper disposal of bait bags. Oregon will be invited to participate.

(2) There is an apparent need for further survey work but it should be done by "experts". Two coastal community colleges will be contacted by staff from the Department of Ecology to determine their interest in helping.

News releases were relatively effective when dealing with the local papers and radio stations. Next year media plans should include emphasis on a specific aspect of the campaign and be localized. It would help to have more lead time and get an earlier commitment from individuals willing to participate. They plan to have a beach cleanup the weekend of September 20-21, 1986.

OTHER STATE PARTICIPATION

As a direct result of the June 3, 1985 "Dear Coastal Colleague" letter, contact was made with the Pacific Whale Center and Greenpeace Hawaii in Honolulu, Hawaii, and the Clean Ocean Action organization in New Jersey.

Two coastal cleanups were held in Hawaii. In all, over 650 volunteers removed approximately 16,300 pounds of debris and trash. Because of bad weather, their cleanups were delayed until October and November.

Clean Ocean Action held a spring cleanup, but has not forwarded the results. They will conduct additional cleanups in 1986.

While attending the 6th Annual Information Exchange Workshop of the Minerals Management Division of the US Department of the Interior in New Orleans, Louisiana in November, 1985, the National Coordinator learned of a small cleanup held on October 13, 1985 in Louisiana. Organized through the Louisiana Nature and Science Center, its coordinator, Margie Schoenfeld, decided to have a cleanup as part of COASTWEEK. The 100 volunteers collected 500 large garbage sacks of trash along the 7.5 mile beach at Grande Isle, Louisiana. They picked up everything in the area but were especially impressed with the amount of styrofoam and plastic.

Grande Isle is in the path of the westerly current flowing past the mouth of the Mississippi River. The cleanup was designed to call attention to the marine debris impacting fish and wildlife in the area. Plans are already underway for an enlarged cleanup of Louisiana's coastline and the beaches of Grande Isle in 1986.

C O N C L U S I O N S

The #1 priority for a successful project in each state is the involvement and visibility of an entity which gives the project "official" standing within that state. For instance:

Oregon Department of Fish and Wildlife
California Department of Fish and Game
Washington Department of Ecology
Massachusetts - National Marine Fisheries Service
Maine - Sea Grant and the University of Maine
Hawaii - Pacific Whale Foundation and Greenpeace

It is imperative to have ample lead time for planning and organizing the cleanup. At least nine months to a year are best. The uncertainty of funding for coordinating the national cleanup in 1985 meant that initial letters to coastal colleagues were not sent until June. Even then it was done with private funds and no official backing. Searching out and identifying state coordinators was not confirmed in most states until early August. This gave some states only six to eight weeks to get everything done, including raising funds for printing and publicity.

A higher emphasis needs to be put on data gathering each year. During the first year of each segment, people participating are not educated sufficiently to make note of specific types of fishing gear. They do not necessarily realize that short pieces of rope may be from fish net webbing or how to identify strapping bands.

The number one value of all of the cleanups is in raising public awareness about the problem. Almost to a person the volunteers remark, "I never realized how much stuff was out there until I had to spend time leaning over to pick it up." In areas where beach cleanups have been conducted and publicity has resulted, the local government officials responsible for monitoring trash containers indicate an increase in the amount of plastic debris which is disposed of properly.

Going after marine debris as "litter" does not have the same impact and gain the same public support as focusing on the issue of entanglement and ingestion by fish and wildlife. That focus really gets people interested in doing something about the problem.

There needs to be a blitz of educational information in national magazines read by lay people, not just in obscure technical and professional journals. There should be repeated information in newspapers. Entanglement and ingestion articles need to be as frequent as articles on acid rain, the persistent pesticides in the California condor, or an oil spill, so the public is aware of the problem and is more familiar with those terms as everyday words.

The secondary value of cleanups is the networking among people in coastal states and organizations to all be working on a common issue. The networking provides a vehicle for communicating findings, comparing how they organized cleanups, what equipment works best, how to get funding, what type of projects fail, and how to work with government officials, etc.

The tertiary value of cleanups is the actual removal of vast amounts of debris from the marine environment. If enough people become informed about the floatable trash problem, they can begin to advise their congressional delegation about the severity of the issue and the need for more stringent ocean dumping regulations.

Special effort should be made to identify individuals willing to "adopt a mile" of coastline and do at least a monthly survey and report the findings to a central clearing agency. The suggestion by the Washington Department of Ecology to involve students from a local community college is an excellent example.

And finally, it appears that interest in cleaning up beaches is widespread and not just confined to coastal residents. As word of the 1984 and 1985 cleanups spread, people from many of the states in the midwest have written to find out how to organize cleanups on lakes and rivers because they too have observed entangled wildlife.

LIST OF APPENDICES

- I A Nuts and Bolts Guide to Organizing
 a Beach Cleanup Campaign the Easy Way
 by Judie Neilson and Linda Schuee,
 June 15, 1985

- II Oregon 1985 Get the Drift and Bag It
 Zone Captain Map of Coast and Tabulated
 Results of Cleanup by Zone and Category
 of Marine Debris, January 22, 1986

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GET THE DRIFT AND BAG IT

A NUTS AND BOLTS GUIDE TO ORGANIZING A
BEACH CLEANUP CAMPAIGN THE EASY WAY

OREGON DEPARTMENT OF FISH AND WILDLIFE



PLAGUE OF PLASTICS



JUNE 15, 1985

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BACKGROUND

This guide evolved from a grassroots effort on Oregon's coast on October 13, 1984 when 2100 volunteers collected 26.3 tons of plastic debris in three hours.

Word about our success spread around the country and requests for information continue to pour in. We decided to share our secrets and encourage others to try similar projects.

Our purpose was to call attention to the proliferation of marine debris and the resulting entanglement and ingestion by wildlife which causes injury or death. We wanted to determine the source and distribution of debris and its rate of accumulation. We hope to develop a means of identifying derelict gear through the creation of a reference collection and assess its impact on fish and wildlife.

By personally involving the general public, we hope to increase their awareness about the problem and enlist their support in finding solutions.

The idea for the first Oregon cleanup was sparked by an article in the Alaska Fish and Game Magazine entitled "The Plague of Plastics." It told how an Alaskan brown bear became crippled and had to be destroyed. The only cause of crippling appeared to be the presence of 37 styrofoam cups in the bear's stomach.

We knew birds became entangled in monofilament fishing line and six-pack rings, but we didn't know wildlife had an appetite for small bits of plastic and styrofoam. So we organized the cleanup of 125 miles of Oregon coast which are accessible.

In November 1984, a Workshop on the Fate and Impact of Marine Debris was held in Honolulu, Hawaii. Scientists from around the world shared information on entanglement and ingestion. Fishing gear, strapping bands, plastic sheets, and bits of styrofoam and plastic were identified as potential threats to wildlife. Workshop participants determined that beach surveys are a legitimate method of assessing the impact of this type of debris in the natural environment.

We hope this booklet inspires you to organize a cleanup, whether on the ocean, a lake, or river.

Judie Neilson
Linda Shuee

CHECKLIST OF NEEDS

Cleanups can be beneficial for ocean, lake and river beaches. Oregon is fortunate because all but 26 miles of its ocean coast is publicly owned. We did not attempt to clean cliff faces or areas which were unsafe to enter. No matter what the area, its helpful to think about having the following:

Steering Committee

Theme

Logo

Chairperson

Honorary Chairperson

Mascot

Volunteers

Area Coordinators and Zone Captains

Food

Certificates of Appreciation

Collection Sacks and Rubber Bands

Gloves

Media Contacts

Telephone Contacts

Information Packets - Map of Area
List of Contacts and Telephone Numbers
Information Sheet on Issue
Poster
Pictures for Use by Media
Pictures for Followup Publicity
Statement of Purpose

Tee Shirts

Souvenir

Questionnaire

Celebration Parties

CHAIRPERSON - COORDINATOR

The general chairperson should be easily accessible by telephone and centrally located. Since Portland is Oregon's major metropolitan area, we located our headquarters there.

Using a state employee as coordinator increased agency visibility and was a good public relations move. This job could easily be coordinated by a statewide environmental council, Audubon or Wildlife Federation chapter, hunting and fishing club, or another natural resource agency. Donations the first year had a dollar value to the state agency of over \$30,000. The only cost to the state was the time commitment by steering committee members, some zone captains, and the chairperson.

During the final two weeks and immediately following the cleanup, this person should be prepared to be involved in little else. The interaction with news media and zone captains is intense.

HONORARY CHAIRPERSON

Oregon did not use an honorary chairperson the first year. We asked a basketball star to help the second year, but he was scheduled out of town during August and September. Other possibilities are a movie star, member of Congress, the governor, or a child.

MASCOT

We toyed with the idea of an animal as mascot but didn't adopt one. We did use "Captain Beware", a bear face in a lifesaving ring, to stress beach safety and warn of rolling logs and sneaker waves. In Texas, a beach cleanup group used Woodsy Owl, Smokey and Bear and Freddie the Fish.

MISCELLANEOUS

Our date of October 13, 1984 was chosen because of low tides and prevailing winds to the west. New debris collects with each tide and there is never a lack of things to pick up. The October date turned out to be too far into our winter storm season, so we moved the campaign forward by three weeks this year.

STEERING COMMITTEE

The Steering Committee was formed simultaneously with the idea for the cleanup. It had a wide variety of people to offer a cross section of interests and serve as a means of drawing resources from their individual agency or organization. They included representatives of:

- Oregon Department of Fish and Wildlife
 - Director's Office
 - Information and Education Section
 - Wildlife Division (Nongame Staff)
 - Fish Division
 - Marine Region

- Portland Audubon Society
- Department of Environmental Quality - Solid Waste Division
- Department of Transportation - State Parks
- Reporter - Statewide Newspaper
- Reporter - Network Television - Portland
- Oregon Trout - Sport Fishermen
- Metro Trollers - Commercial Fishermen
- Oregon Sanitary Service Institute - Garbage Haulers
- Two Citizen Members - no group affiliation, but known for past involvement on environmental issues
- High School Teacher - environmental sciences educator.

This group was used for brainstorming, as a source of contacts for other interest groups, and for general planning. Several had access to the media and to printing or graphic art facilities. The State Parks person identified the accessible areas at the coast, the garbage hauler coordinated trucks and drivers, and the Department staff people helped with fact sheets related to fish and wildlife issues.

The group identified zone captains and helped coordinate the media relations and special events. Although the original steering committee had twenty people, a core of less than ten regularly attended later meetings.

ROLE OF ZONE CAPTAINS/COORDINATORS

Choosing zone captains early in the campaign is very important. They identify specific areas of the coast where debris accumulates, which areas are accessible, and which areas are unsafe.

The zone captains also coordinate the collection of filled sacks with the local refuse haulers, contact the news media in their zone, and find groups to prepare and serve the food.

The day of the cleanup, they are at the designated meeting sites distributing sacks, rubberbands, and information on debris. They caution everyone about beach safety and announce where the celebration parties are held. They also assign volunteers to specific areas within their zone to be cleaned.

The first year, we depended mostly on the local district fish or wildlife biologists to be the zone captains. We also had an educator, port official, bank manager, and two retired educators. This year coastal residents who participated in the cleanup the first year have offered to serve as captains.

Each zone captain was supplied with a bright green tee shirt to identify them as the person in charge.

The zone captains also contact local business to get donations of condiments or serving utensils for the celebrations.

THEME AND LOGO SELECTION

Our first theme, Plague of Plastics, was very popular and caught the attention of the public. Although it had a negative connotation to some industry people, it was eye catching, short, and dynamic.

We experimented with "Save a Critter - Pick up Litter", but decided it focused on litter rather than debris. The public tends to tune out the word litter because it has become a buzz word.

"Get the Drift and Bag It" was chosen because it describes the purpose of the campaign, is non-controversial, and is catchy. It also indicates the joining of two major efforts, the Stop Oregon Litter and Vandalism "Bag it Days" and the second annual cleanup, "Get the Drift."

The Plague of Plastics logo was created by a graphic artist who donated his services. We had no preconceived ideas about what it should look like, and just asked him to give us his thoughts. After reading the informational articles, he came up with the logo. The Plague of Plastics logo is not copyrighted and may be used by anyone who cares to.

We used the logo in developing a poster. We experimented with printing the poster in color but the black and white turned out to be the most striking and was less expensive to print.

It was a mistake putting a date on the poster. Because we were working within a short timeframe, the posters were not available prior to the pickup. Being dated, they were removed after the October 13 date. The original idea behind the posters was that they should be displayed at marinas, outdoor stores, and places where boaters congregate as a reminder not to discard debris into the water.

A new poster is being designed for the second annual cleanup. It will be available free to anyone requesting a copy.

VOLUNTEERS

Most volunteers came forward after hearing about the cleanup on radio and television or reading about it in the newspaper. Originally we attempted to register each volunteer and get an idea about where they wanted to cleanup the coast.

When the numbers grew, we finally announced specific meeting sites at the coast and instructed each person to show up at a specified time. Newspapers around the state listed the meeting sites and time.

We did mail a reprinted article from National Parks Magazine explaining the scope of the debris problem and why it is important to remove the materials from the natural environment. In followup interviews with volunteers by the press, they appeared well informed on the issue. This gave the campaign more credibility and helped all those involved be committed to a specific issue.

Volunteers represented many groups, but fell into the following categories: Special Olympics, Boy Scouts, college ecology clubs, church groups, the Mail Handlers' Union, a group of retired telephone employees, a Take Off Pounds Sensibly group, Kiwanis, Lions, and Rotary, grade school classes, a business club, the Mazamas Outdoor Club, Audubon Societies, Izaak Walton League, Oregon Shores Conservation Coalition, Oregon Association of Recyclers, branches of three state agencies who had organized crews, 4-H Clubs, Equestrians, Girl Scouts, Recreation Trails Advisory Committee, Oregon Bass and Panfish Club, Soccer Club, Association of Northwest Steelheaders, Public Defenders of Clackamas County, Job Corps, Nature Conservancy, Brownies, and Soroptimists.

In coming years we hope to enlist the help of organized groups to "adopt" a beach. Regular surveys of specific areas will help gain insight into the rate of accumulation and type of debris which is the most prevalent. This was not stressed the first year because we had no idea how many people would be interested.

It was the volunteers who requested this be an annual event. An astounding 80% of those participating returned their completed questionnaires, giving us an excellent data base the first year.

SPONSORS

You should let your imagination run when seeking sponsors or donations. You never know where your support will come from. The first one Oregon received was when the chairperson just happened to mention she was thinking about such a project to her dentist. The next thing she knew, the Oregon Society of Periodontists volunteered to pay all the postage costs for the cleanup and printed the free lunch cards.

The second year the original sponsors and donors have called to see how they can be involved, and several have asked for a "laundry list" of things needed so they can expand their support. Here is a list of the items donated the first year and the type of sponsor:

- *A public utility, Portland General Electric, donated printing of informational material, questionnaires, and maps.
- *The Oregon Society of Periodontists donated lunch cards and postage for all mailings.
- *Transwestern Helicopters and the Samuel S. Johnson Foundation joined to donate free helicopter time for the video company filming our documentary film.
- *Five coastal community banks donated \$250.00 each to help feed volunteers.
- *Armour Foods donated 307 dozen "dogs kids love to bite."
- *United Grocers donated 307 dozen hotdog buns.
- *Beverage companies donated soft drinks.
- *Grocery stores donated napkins, food utensils, and condiments for celebration parties.
- *Service clubs organized the celebration parties, cooked and served the food and cleaned up afterwards.
- *Oregon Sanitary Service Institute donated tee shirts for zone captains, their own collectors, and the governor; and donated trucks and drivers to collect the filled sacks of debris. They also paid the landfill fees and gave up their Saturday.
- *Stop Oregon Litter and Vandalism donated 5,000 - 20 gallon collection sacks.
- *Western Transportation Company donated 5,000 rubberbands to close the collection sacks.
- *Fred Meyer, Inc., printed 5,000 large Plague of Plastics posters.

MATERIALS

As a bare minimum, the following items should be supplied to each volunteer.

SACKS: Twenty gallon heavy plastic collection sacks were donated by Oregon Stop Oregon Litter and Vandalism (SOLV) for the Oregon campaign. They were a light tan color and were strong enough not to tear open when full. We discussed the possibility of using heavy kraft paper bags or some other material, but this was dismissed because other products are too heavy to distribute cheaply and easily. Also, our weather is usually wet and we needed something that would hold up.

The color of the bags is important for the media. Our tan bags did not show up well on television. The sacks for the current year are opaque white with bright red letters and logo. Other colors suggested are hunter orange or bright blue or green.

Having a uniform color of sacks for all volunteers makes a real statement to observers. It's easy to pick out the gleaners from joggers and other beachcombers. One supplier of sacks is preferable to an assortment.

GLOVES: For our first cleanup, only one group of volunteers had gloves. They were bright yellow. Supplying gloves for everyone or encouraging them to use gloves is highly recommended. It protects their hands from sharp objects, avoids sandy fingernails when trying to dig objects out of the sand, and avoids problems related to picking up dead seabirds and disposable diapers.

RUBBERBANDS: We supplied heavy duty rubberbands for each sack distributed. These were donated by one sponsor. They could also be procured locally by each zone captain. The rubberbands helped keep the filled sacks under control until picked up by the refuse collectors. Rope or twistums could be used also.

FACT SHEET: We gave each volunteer a fact sheet and they knew exactly why they were working to clean up the beach in addition to getting rid of the debris. When interviewed for television or the newspaper, they all gave similar answers about wildlife eating styrofoam or getting caught in six-pack rings.

CELEBRATION PARTIES

The celebration parties along the coast after the cleanup were extremely popular. Everyone enjoyed getting together to swap stories about the most interesting items they found - from a Japanese hard hat to a Barbie Doll comb -, how many sacks they filled, and how much rope they found, etc.

Our weather was cold and blustery. Some zones had a big fire and everyone gathered around to get warm and dry. Others were in community buildings and volunteers could sit down to eat.

Celebration parties did not last more than an hour. Our collection hours were 9 AM until Noon so we served lunch. Because many people had gotten up early to drive to the coast from our metropolitan areas, they were anxious to get back in their cars and drive home before dark.

One of the most difficult tasks of the entire campaign was trying to figure out how to divide 307 dozen hotdogs fourteen ways. In some zones we had only 25 volunteers; in others there were as many as 300. The food left over was donated to charitable organizations who either used it for another civic event or froze it for future use.

Armour Foods donated the hotdogs and United Grocers donated the buns. Working through their outlets, they made arrangements for the food to be picked up at fourteen locations.

Independent soft drink distributors either donated or sold their products at cost. One zone captain procured boxes of apples and bags of potato chips. Another personally prepared potato salad and baked beans and one made cookies.

Preparation of the hotdogs varied from being served in a school cafeteria to being roasted on a stick over an open fire. That decision was left up to the local coordinators.

As a souvenir, and to identify the volunteers, we printed cards which said "I picked up plastic and I get a free lunch." The cards (3x5 inches), also had a message thanking the volunteer and talking about the problem of debris. We had no problem with "gate crashers", so it was not necessary to have the volunteers present the card to qualify for lunch. The cards also had the date and logo on them.

GENERAL INFORMATION

In November, 1984, the citizens of Moses Lake, Washington cleaned up 40 miles of shoreline of their irrigation lake. They dealt with some different logistical problems than Oregon. Some of these may be helpful in your planning.

VEHICLES: All vehicles involved in the cleanup are authorized and directed to use their flasher lights throughout the work area.

RIDERS IN VEHICLES: All riders in the back of pickups and trucks must be seated on the floor of the bed.

BE CAREFUL: Constantly coach each other on unsafe conditions and in case of accident or injury summon a patrol boat if one is in sight as these units have help and radio communications. If a boat cannot be summoned, go to the nearest phone and call () for minor happenings and 911 for more serious problems.

BE THOROUGH: Assign crews in a teamwork effort and have one inspector person walk behind everyone else calling attention to missed items.

ITEMS TO BE PICKED UP: Everything of a foreign nature--especially broken glass, no matter how small.

LARGE ITEMS: Items that cannot be lifted by your whole crew should be made record of, or tell the patrol boats you need a wrecker or front-end loader and one will be dispatched if possible. In the meantime go on with your section.

PACKING OUT FULL BAGS AND MATERIALS: When you have to pack materials out to a street access area, let someone know it needs to be picked up, OR when your crew finishes, go back and pick up everything and bring it to the Central Area.

PRIVATE PROPERTY ACCESS: If you must proceed through private property, please try to obtain permission to cross. If you must cross, be very careful and respectful of the area.

HELP FROM LAW ENFORCEMENT: All law enforcement agencies are aware of the cleanup and are ready to help or relay messages or information to the Central Area. Feel free to wave them down for help.

RETURNING THE TRASH TO CENTRAL AREA: Upon return to the Central Area, your load of trash will be received by an attendant who will instruct where and how to unload your bounty.

CERTIFICATES OF COMPLETION: Certificates of Participation can be obtained at the same desk where you registered in the Moses Lake Conservation District Office.

MEDICAL ATTENTION: Medical attention will be available at both the Central Area or at the hospital through normal private procedures. If an accident or injury occurs, you can signal a patrol boat to your aid since they will have radio communications to the Central Area.

CHILI FEED: The feed will begin at 2 PM and is open to all participants. Restrooms in the Central Office are available to clean up before proceeding across the parking lot at the ambulance barn.

OFFICIALS: Officials will be wearing blue and gray arm bands and will be traveling throughout the area to answer questions.

VIDEO FILM

During the filming of a news story prior to the cleanup, Eleanor Dye of the Oregon Sanitary Service Institute had the idea to produce a video film. She felt it would be a shame to just get everyone all fired up about marine debris for three hours and not have anything to share about the experience afterward. As the result of her idea, we raised \$8,000 from industry, foundations, organizations, and business to produce a 12 minute video film.

Entitled "Get the Drift", the film tells the Oregon story... how the coast cleanup came about, the results, and what other people might do to help solve the problem of marine debris.

The film is available in both 3/4 inch and 1/2 inch at a cost of \$100. A portion of the purchase price goes to the Oregon Wildlife Heritage Foundation to continue the work of solving the marine debris problem.

Copies may be obtained by writing directly to HORIZON VIDEO, 409 SW 10th, Newport, Oregon 97365.

The film is suitable for showing to schools and civic groups in an attempt to spread the word about a worldwide problem and is not restricted to Oregon audiences.

Felicia C. Coleman
and D.H.S. Wehle

Plastic Pollution: A Worldwide Oceanic Problem

From Newfoundland to Australia, biologists studying seabird feeding ecology in the early 1970s started noticing an odd prey item in their subjects' diets: plastic. Their tales were soon joined by similar ones of plastic ingestion and entanglement in plastic debris, in a wide variety of marine organisms including fish off the southern New England coast, sea turtles off Costa Rica and Japan, and whales in the North Atlantic. At the same time, scientists conducting planktonic and benthic surveys in both the Atlantic and Pacific oceans found unprecedented numbers of plastic particles among their samples [Feder et al., 1978; Colton et al., 1974], and members of both Ra expeditions observed plastic pollution while crossing the Atlantic [Heyerdahl, 1971]. Plastic pellets washed ashore in New Zealand in such large quantities that some beaches literally seemed covered with "plastic sand" [Gregory, 1978]. By the close of the decade, a new problem had been added to a growing list of ecological concerns—plastics at sea.

Plastic shows up in the marine environment in two forms: manufactured pieces and raw particles. Those who frequent coastal regions are painfully aware of the prevalence of manufactured plastic litter along the shore. Most of this refuse is generated by transport, fishing, and recreational vessels. In 1975, the US National Academy of Sciences estimated that commercial fishing fleets alone dumped more than 52 million pounds of plastic packaging material into the sea, and probably lost more than 298 million pounds of plastic fishing gear, including nets, lines, and buoys [Merrell, 1980].

Raw plastic particles—the spherules, nibs, cylinders, beads, pills, and pellets (each about the size of a wooden match head) from which products are manufactured—enter the ocean via inland waterways and outfalls from plastic manufacturing plants. They are also lost from freighters during loading and unloading, and, upon occasion, are deliberately dumped into the sea.

However it manages to reach the sea, plastic debris is ubiquitous. It has turned up in benthic sediments along the industrialized coast of Great Britain in concentrations of 2,000 pieces per square meter [Morris & Hamilton, 1974]; near Auckland, New Zealand, at densities greater than 100,000 pieces per lineal meter of beach [Gregory, 1978]; in the Mediterranean Sea as enormous floating masses [Morris, 1980]; and in coastal regions of the United States, Portugal, Colombia, Lebanon, and such remote sites as the Aleutian and Galapagos Islands. Members of the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP)—a nationally coordinated program of the US National Marine Fisheries Service (NMFS)—found large quantities of raw plastics in the open ocean, particularly in the Sargasso Sea, an area in which floating debris is known to accumulate; this would indicate that winds and currents play an important role in distributing and

concentrating particles in certain oceanographic regions. Given the presence of plastic particles in the marine environment, it was only a matter of time before they turned up in the digestive systems of animals that forage at sea.

One of the earlier known occurrences of plastic ingestion was in 1962 for an adult Leach's storm-petrel collected off Newfoundland [Rothstein, 1973]. In 1966, researchers in the Hawaiian islands found plastic in the stomach contents of nestling Laysan albatrosses, indicating that the parents had picked up the plastic as "prey" and fed it to their young [Kenyon & Kridler, 1969].

As the data accumulated, certain patterns emerged: for example, in the Northern Hemisphere, North Pacific and North Atlantic procellariids (particularly shearwaters and fulmars) and North Pacific alcids (particularly auklets and puffins) contained more plastic material than other seabirds in those areas, including phalaropes, gulls, terns [Day, 1980]. To date approximately 15 percent of the world's 280 species of seabirds are known to ingest plastic.

While seabirds choose from a wide array of plastic objects during foraging (including raw particles, fragments of processed

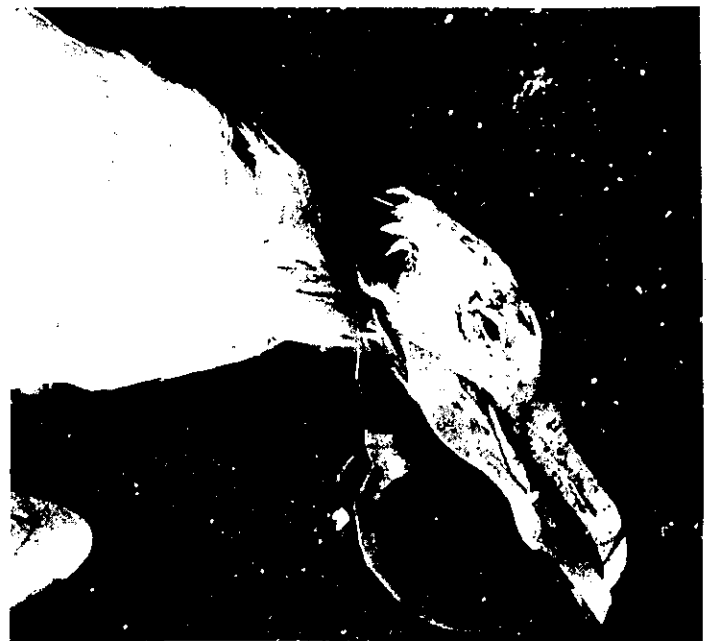


photo by Charles O'Claire, NMFS

The death of this gull can be attributed directly to the plastic yoke from a six-pack of drink cans. These yokes are almost invisible in the water, and both divers and surface water feeders are particularly susceptible to such entrapment.

products, detergent bottle caps, and toy soldiers, cars, and animals), marine turtles consistently select only one item — plastic (polyethylene) bags. In the past fifteen years, biologists have found plastic bags in the digestive tracts of four of the seven species of marine turtles: including leatherbacks off the coast of the US, French Guiana, South Africa, and France; hawksbills on the Caribbean coast of Costa Rica; greens in the South China Sea, and in Japanese, Australian, and Central American coastal waters; and olive ridleys in the Pacific coastal waters of Mexico. Polystyrene spherules have been found in the digestive tracts of one species of chaetognath (transparent wormlike animals) and eight species of fish in southern New England waters [Carpenter et al., 1972]. They have also turned up in several species of bottom-dwelling fishes in the Severn Estuary of southwestern Great Britain [Kartar et al., 1976].

Marine mammals are not exempt from participation in the plastic feast. Pygmy sperm whales, rough-toothed dolphins, Cuvier's beaked whale, and West Indian manatees are all involved, eating mostly plastic sheeting or bags. Fishermen report Minke whales eating plastic debris thrown from commercial fishing vessels. Curiously, plastic has not been found in any of the thousands of Alaskan ribbon, bearded, harbor, spotted, ringed or northern fur seal stomachs examined.

The obvious question arising from this mish-mash of data is, Why do marine animals eat plastic? Robert H. Day (1980), in the most comprehensive study of plastic ingestion to date, maintains that seabirds, at least in Alaska, eat plastic because they mistake it for natural prey items. For example, in all the parakeet auklets Day examined, most (94%) of the ingested plastic consisted of small, light brown pieces that bore a striking morphological resemblance to the small crustaceans on which the birds typically feed.

Marine turtles also seem to mistake plastic objects for potential food items. For turtles, transparent polyethylene bags apparently evoke the same feeding response as do jellyfish, the major food item of leatherback turtles, and subsidiary prey for greens, hawksbills, loggerheads, and ridleys.

Sea birds, marine turtles, and marine mammals all eat plastic. So what? It could be that plastic ingestion is inconsequential to their health. After all, a cow can retain nails, metal staples, and strands of barbed wire in its stomach for more than a year with no ill effects. This, however, does not appear to be the case for many marine organisms that eat plastic. George R. Hughes (pers. comm.) of the Natal Parks Board, South Africa, extracted an enormous ball of plastic from the gut of an emaciated leatherback turtle; unravelled, the plastic measured three meters wide and four meters long. The plastic ball completely obstructed the turtle's normal digestion and presumably led to its malnourished condition. Similarly, a mass mortality of green turtles off the Costa Rica is attributed to the turtles' ingestion of plastic banana bags thrown from a dock [Cornelius, 1975].

We know that plastic is virtually indigestible and that individual pieces may accumulate and persist in the gut for extended periods of time. A growing body of evidence indicates that ingested plastic causes a multitude of gastro-intestinal problems. It may reduce an animal's hunger sensation, and thus inhibit feeding activity; this, in turn, could result in low fat reserves and an inability to meet the increased energy demands of either reproduction or migration [Connors & Smith, 1982]. Plastic may cause ulcerations in the stomach and intestinal linings, and is suspected of damaging other anatomical structures, such as the delicate fringe used in prey capture on the bills of prions. Finally, plastic ingestion may contribute to the level of synthetic chemicals in body tissues. Some plastics contain PCBs, a chemical known to cause eggshell thinning, aberrant behavior, and tissue damage;

others, such as polystyrene spherules are not made with PCBs, but apparently absorb them from ambient sea water [Carpenter et al., 1972]. Some plasticizers concentrate in fatty tissues; when these highly contaminated tissues are mobilized for energy, toxins may be released in lethal doses.

Publication of data on plastic ingestion is in its infancy. As the problem gains notoriety, it is certain to be revealed as being even more widespread than is now recognized. One indication of this is the occurrence of secondary ingestion, in which plastic consumed by animals feeding at low trophic levels is passed on through them to higher-level consumers. Plastic pellets found in the castings of a predatory South Polar skua in the South Atlantic apparently got there by way of a broad-billed prion eaten by the skua [Bourne & Imber, in press]; plastic pellets found in the Galapagos Islands came from transport vessels in Ecuadorean ports through a food chain involving fish, blue-footed boobies, and finally, short-eared owls [Anonymous, 1981].

A more obvious effect of plastic pollution is the aesthetic one. Whether we venture deep into the woods, high atop a mountain, or out on the ocean to escape the trappings of civilization, our



This fur seal is girdled by a discarded plastic band used for strapping closed large boxes or similar containers. The material is water and rot resistant, and this animal has little hope of survival. As it grows the band will cut deeper and deeper into the flesh, causing increasing pain and a lingering death.

experience of the natural world is often marred by the discovery of human litter. Even more disturbing is the sight of a young pelican entangled in fishing line and dangling helplessly from its nest, a whale rising to the surface with its flukes enshrouded in netting, or a seal nursing wounds caused by a plastic band cutting into its flesh. Unfortunately, such observations are becoming more and more common, another consequence of plastics at sea.

During the last 20 years, fishing pressure has increased dramatically in all the world's oceans, and with it, the amount of fishing-related debris dumped at sea. With the advent of synthetic fibers after World War II, the type of fishing equipment shifted from the traditional nets of hemp, cotton, or flax (which sank if not buoyed, disintegrated within a relatively short period of time, and which because of the size of their fibers, were largely avoided by diving seabirds and marine mammals) to synthetic monofilament nets, which are more buoyant and longer-lived than their predecessors, and nearly invisible under water, a distinct disadvantage to animal in the net's vicinity.

One result of the change in net materials has been an increase in mortality of air-breathing animals either through incidental capture or entanglement. Incidental catch refers to the capture of non-target animals in actively working fishing nets; entanglement is the capture of any animal in lost or discarded nets. Unlike working nets, which fish for specified periods of time, these free-floating nets, often broken into fragments, fish indefinitely. When washed ashore, they may also threaten land birds and mammals: in the Aleutian Islands, a reindeer became entangled and died in a Japanese gill net that had washed up on the beach. During the heyday (1972-76) of the Danish salmon fishery in the North Atlantic, the incidental catch of thick-billed murres reached three quarters of a million birds a year [Bourne, 1971; Tull et al., 1972]; in 1980, the incidental catch of sea turtles in shrimp trawl nets off the southeastern coast of the United States was around 2,000 animals. Some government officials estimate that about 50,000 northern fur seals currently die in the North Pacific each year as a result of entanglement in fishing gear.

While not fishing-related in the usual commercial sense, there are incidences of capture of cetaceans and sea turtles off the coast of Natal each year. Natal's beaches are important to the economy of the area. A number of shark attacks along those beaches during the height of the resort season proved nearly disastrous to local businesses. In an effort to rectify this, park officials set gillnets offshore to keep sharks from moving in near bathers. While effectively, but not selectively, taking sharks, the nets also caught cetaceans moving inshore to feed on small fish, and turtles coming in to nest [Best & Ross, 1977]. The local officials now find themselves in an awkward position, faced not only with the problem of shark attack, but with receiving a good deal of bad press relating to the capture of marine mammals. They are working to alleviate the problem through close monitoring of beaches: forbidding swimming and rolling up nets during periods of cetacean and/or turtle migration inshore.

Plastic strapping bands, used to secure crates, bundles of netting, and other cargo, are another common form of ship-generated debris that is harmful to marine mammals [Merrell, 1980]. Discarded bands are often found girdling pinnipeds (e.g., seals and sea lions), animals that are particularly susceptible to entanglement because of their proclivity for examining floating objects. Sea birds that frequent recreational waters or coastal dumps, such as gulls and terns, are subject to ringing by the plastic yokes used to package six-packs of beer and soft drinks. With the rings caught round their necks, the birds may be strangled when the free end of the yoke snags a protruding object. Pelicans, which plunge-dive to feed, run the risk of diving beak-first into yokes thrown in the water. With a ring firmly wedged around its bill, the bird is unable



This derelict trawl web net that washed ashore on Amchitka Island is a common site. Free-floating synthetic monofilament nets are also frequently seen, both ashore and floating at sea—a potential danger to birds and animals wherever they appear.

to feed and may well die of starvation.

The problem of plastics at sea is global and its solution will require international cooperation. Historically, the high seas have been considered an international no-man's land. Recently, however, perception of the ocean as a finite and shared resource has caused many nations to express concern for its well-being.

In 1970, the U.S. Congress passed the National Environmental Policy Act, which, among other things, led to the adoption of a number of laws on waste disposal, two of which included pollution by plastics. Having laws on the books, however, does not solve the problem. Small scale refuse disposal on the high seas is difficult to regulate; fishermen who unintentionally lose their nets at sea cannot be held responsible; and illegal large-scale dumping at sea is hard to detect. Granted, laws must be more stringent, but enforcement is really the bigger problem.

On the international level, the United Nations Conference on the Human Environment, held in Stockholm in 1972, highlighted water pollution and litter in the ocean. The conference, representing 110 nations, defined the need for international policy on marine pollution among coastal and maritime nations. Treaties to implement such a policy soon followed: the 1972 London Convention on the Prevention of Water Pollution by Dumping of Wastes and Other Matter (Ocean Dumping Convention), a part of

which specifically prohibits marine dumping of persistent plastic material; and the 1973 London International Convention for the Prevention of Pollution from Ships (Marine Pollution Convention), which is broader in scope, regulating the control of oil pollution, packaged substances, sewage, and garbage [Moore, 1975]. While neither treaty has been adopted by all nations, each represents a start toward global control of marine pollution.

Ironically, the very characteristics that make plastic appropriate for so many uses—its lightweight, strength and durability—lead to the majority of problems associated with its occurrence at sea. The longevity of plastics in seawater is not known, but on the beach, particles may last anywhere from 5 to more than 50 years. Given plastic's long life, our handling of plastic pollutants, and the projected annual increase in production [Guillet, 1974], one thing is clear—the rate of plastic deposition in the marine environment will remain higher than the rate of its disappearance. In a study of plastic accumulation rate on the beaches of Amchitka Island, Theodore R. Merrell, Jr., (NMFS) recorded 550 pounds of plastic litter added to less than a mile of beach in one year [Merrell, 1980]. He also found a 250 percent increase in both the number and weight of plastic items washed ashore over a two year period.

Outside the realm of laws and treaties, immediate remedies to continued plastic pollution can be generated both within and outside of the plastics industry. We already have the technology to manufacture biodegradable plastics. In fact, one of the beauties in plastic is its malleability: its properties can be altered and its life expectancy prescribed. Alaska is ahead of the game, in this respect. Alaskan law already requires that plastic six-pack yokes be made of a self-destructing compound. But are the compounds released by degradation more harmful than the intact plastic? This is an important fact to consider.

Another, but perhaps less workable solution (given the logistics and expense involved, and the degree of business and public cooperation required) lies in recyclable plastics. At the very least, all countries should require that the outflow from industrial plants be filtered for plastic particles before it enters the waterways. A recent decline in the uptake of plastic by marine organisms in southwestern England has been attributed, in part, to the efforts of one of the major contaminating plants to filter, collect, and reuse raw particles present in its effluent.

Consumers share with industry the responsibility to reduce plastic pollution. Recreational boaters and commercial fishermen discard plastic refuse that would better be held onboard until they return to port. If six-pack yokes or strapping bands must be discarded at sea, the rings should be cut first so that they pose less of a threat to marine animals; other plastic refuse generated on large vessels could be burned in nonatmospheric polluting incinerators or compacted for shore disposal.

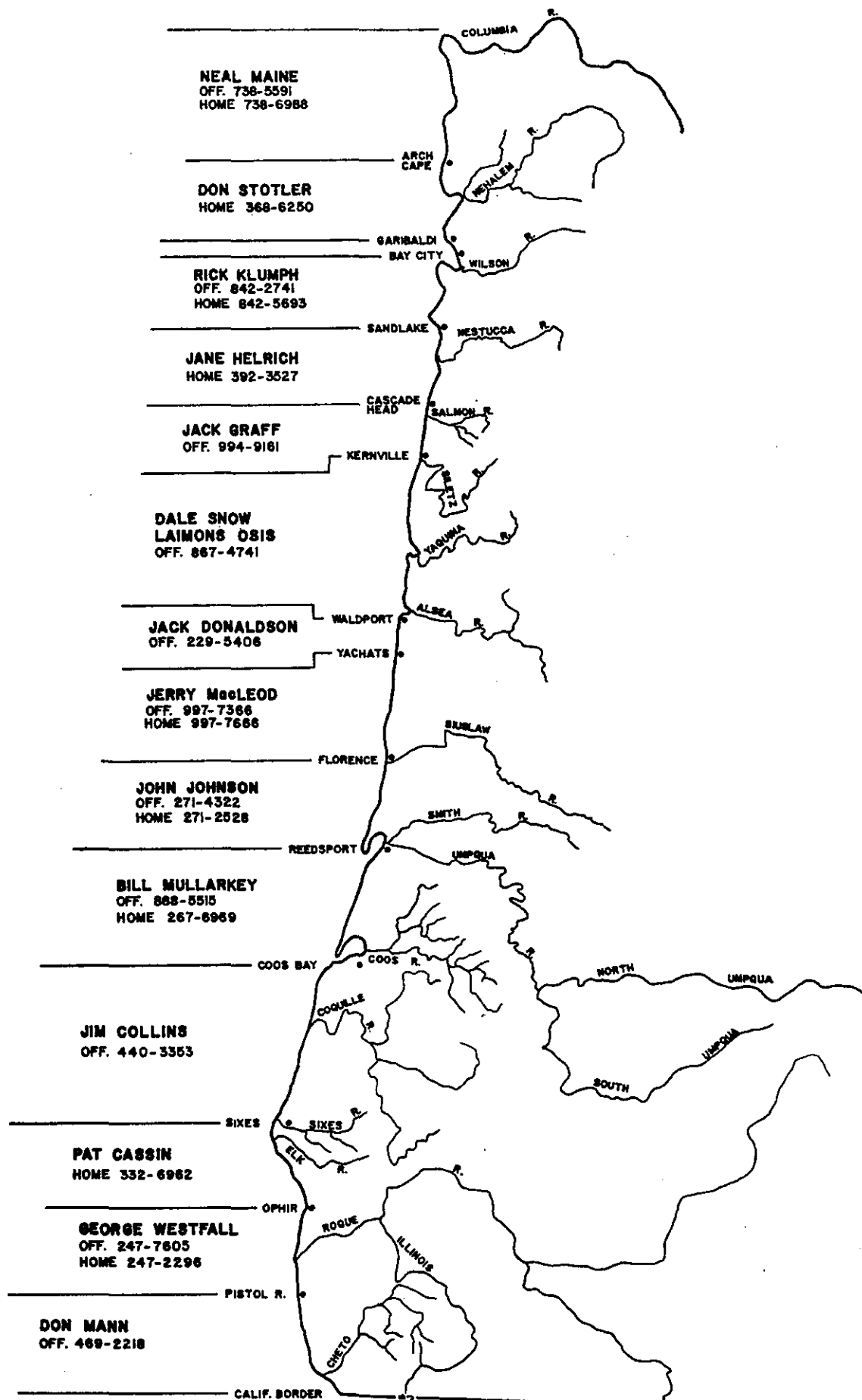
The first step in combatting plastic pollution is to alert both industry and the general public to the gravity of the problem and the urgency of doing something about it. Park management is in a unique position in this regard. It is often through the park system that people acquire a reverence for the natural environment, and pick up on ways to illustrate that respect. Education alone won't solve it, but it is a start. Public awareness of the problem, combined with the resolve to correct it, can bring dramatic results.

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Unless otherwise noted, photos are by Dr. Theodore Merrell, National Marine Fishery Service.



PLAGUE OF PLASTIC PICKUP
ZONE CAPTAINS

OCTOBER 13, 1984

Volunteers slate gigantic cleanup of Oregon coastal beaches

Tom McCall would pop his buttons with pride over the proposed biggest environmental cleanup in Oregon since he rescued the Willamette River.

And this idea may be an even bigger challenge.

A coalition of state agencies, private environmental organizations and individuals are planning one of the most massive cleanup efforts in recent Oregon history — a "Plague of Plastic Pickup" along Oregon's 310-mile coastline.

On Saturday, Oct. 13, volunteers will converge on the 150 miles of accessible beaches on the coast to pick up the plastic litter washed ashore during the past decades of man's exploitation of the synthetic catch-all.

Why? For one thing, because it's there. It is unsightly. It can be dangerous to man. It kills wildlife. Take your pick.

Walk down a small section of the tide line during the next trip to the ocean and pay close attention to what once was a pristine landscape described by many as the most beautiful the Pacific has sculpted.

Count the shreds of nylon netting at Gearhart, the champagne pop-tops below Cannon Beach's cliffside condos and the butter tubs, marine oil bottles and other debris along Netarts spit.

Better yet, get on your knees and run your fingers through the hundreds of styrofoam beads and shreds lodged in the dried kelp. Then imagine yourself one of half of the known bird species that inhabit the beach, foraging for little white and tan worms, bugs and other organisms in the same kelp.

How it must feel to have your stomach full and satisfied with all that styrofoam, your mind being told, "I'm full," but your emaciated body unable to crawl to the next pile.

Stick your child's neck through a piece of net or a plastic six-pack ring and watch him or her grow in agony and pain until the restraint finally chokes off life.

No, it isn't pretty.

But it's there.

Beaches of the world have become a battlefield of environmental concern — concern



Bill
Monroe

that the war is being lost to a cadre of litterbugs so stupendous in scope it is staggering.

Sportsmen, picnickers, commercial fishermen, seamen aboard ocean-going vessels, military: all share the blame for the mess that has washed ashore even on the most remote Alaskan seascapes.

Enter Oregon's coastal cleanup, a concept endorsed at a recent national meeting of wildlife managers and catalyzed in the state Fish and Wildlife Department with the blessing and assistance of state Parks and Department of Environmental Quality.

Involved so far are the Audubon Society, news media, some Scout groups, conservation

organizations, individuals, even the Oregon Association of Periodontists, who were tipped off during a routine visit to her dentist by Judie Neilson, Fish and Wildlife Department executive assistant.

"It's got fire and it's apolitical," said Dr. Tom Merchant.

"I haven't spoken to anyone who isn't caught up with the idea," Neilson said. "It's really taking hold."

While the ad hoc task force planning the effort will take everyone it can get, the target is 1,500 volunteers, each to adopt a section of beach at a density of 10 people per mile.

They will do to the beach what litter patrols do to keep Oregon's highways among the nation's most sparkling.

The Oregon Garbage Haulers Association has volunteered trucks and drivers to haul the plastic trash to landfills that bury — not burn — debris.

The U.S. Forest Service, Fish and Wildlife Service and Bureau of Land Management also will be asked to join as well as Boy and Girl Scouts, runners, equestrians, school groups,

fishing and hunting organizations, commercial fishing organizations... In short, anyone who will help.

Bags will be provided to volunteers and numerous post-pickup beach parties are being planned the length of the coast, with a major gala celebration planned for the Newport area on that Saturday.

For further information or to sign up, call Neilson at the Fish and Wildlife Department or write to her in care of the department at P.O. Box 3503, Portland, Ore., 97208.

CLARIFYING the statement Monday that a "bull" tag sale cutoff date is Aug. 24, the sentence should have read "bow" tag cutoff; same date.

Controlled hunt drawings were held on schedule Tuesday and successful applicants should be getting their notice in the mail by early next week.

A list of successful tag-olders will be available at the Fish and Wildlife Department offices Tuesday, Aug. 21.

Please don't call before then, then ask department information staffers.

PLASTIC DEBRIS AND WILDLIFE

WHEREAS plastic debris is increasing worldwide and tends not to disintegrate; and
WHEREAS plastic debris may be crippling or fatal to aquatic and terrestrial wildlife when mistaken for food and may be transferred through the food chain; and
WHEREAS fish, birds, and mammals die every year from entanglement in plastic debris;
NOW THEREFORE BE IT RESOLVED, the Western Association of Fish and Wildlife Agencies encouraged its members to inform legislative and administrative bodies and the general public of the danger of plastic debris to wildlife, and of the need to reduce its proliferation into the environment.

Adopted by the Western Association of Fish and Wildlife Agencies in Convention Assembled
July 19, 1984, in Victoria, British Columbia.

WHAT YOU CAN DO

Adopt a mile of beach and clean it up on October 13. (9 AM to Noon)

Take photographs of people cleaning up the beach to record the effort.

Find a business in your area willing to display a poster to bring the issue of plastic debris to the public's attention.

Join us at 1 PM for a picnic celebration at a location designated by the zone captain where you pick up plastic.

Contact a zone captain listed on the other side of this message.

JUDIE NEILSON, OREGON DEPARTMENT OF FISH AND WILDLIFE
P O Box 59, Portland, OR 97207
(503) 229-5406

FIRST ANNUAL PLAGUE OF PLASTIC PICKUP - OCTOBER 13, 1984 - QUESTIONNAIRE

NAME OF GROUP OR INDIVIDUAL _____

TOTAL PERSONS IN GROUP _____ Male _____ Female _____ Age(0-18) _____ (18-40) _____ (40+) _____

CHECK TYPE OF AREAS SEARCHED Sandy Beach _____ Rocks (jetty) _____ Estuary Shore _____ Rocky Beach _____
Road Access _____ Other _____

LOCATION AND ESTIMATED MILES SEARCHED _____

ESTIMATED TOTAL POUNDS COLLECTED _____

| TYPE OF DEBRIS | NUMBER OF PIECES | TYPE OF DEBRIS | NUMBER OF PIECES |
|--------------------------|------------------|---------------------|------------------|
| Plastic bag or sheet | _____ | Plastic Eating Gear | _____ |
| Plastic rope | _____ | (cups, utensils) | _____ |
| Plastic strapping | _____ | Plastic containers | _____ |
| 6-Pack Holders | _____ | (bottles, etc.) | _____ |
| Styrofoam | _____ | Fishing Gear | _____ |
| Other Plastic (Identify) | _____ | | _____ |

PROBABLE SOURCE (Estimate percentage) Human Beach Use _____ Ocean Drift _____

SPECIAL OBSERVATIONS _____

PLEASE RETURN TO: Judie Neilson, Oregon Department of Fish and Wildlife
P O Box 59, Portland, OR 97207

SIDE 1-SAMPLE

T H A N K Y O U

STAMP

Judie Neilson
Oregon Department of
Fish and Wildlife
PO Box 59
Portland, Oregon 97207

S I D E 2
SAMPLE

Thank you for helping free Oregon's coastal beaches of plastic debris. Ask your friends to help solve the problem of discarded plastic. Pack it home!

**JUDIE NEILSON, COORDINATOR
OREGON DEPARTMENT OF FISH & WILDLIFE
P.O. BOX 3503, PORTLAND, OREGON 97208**

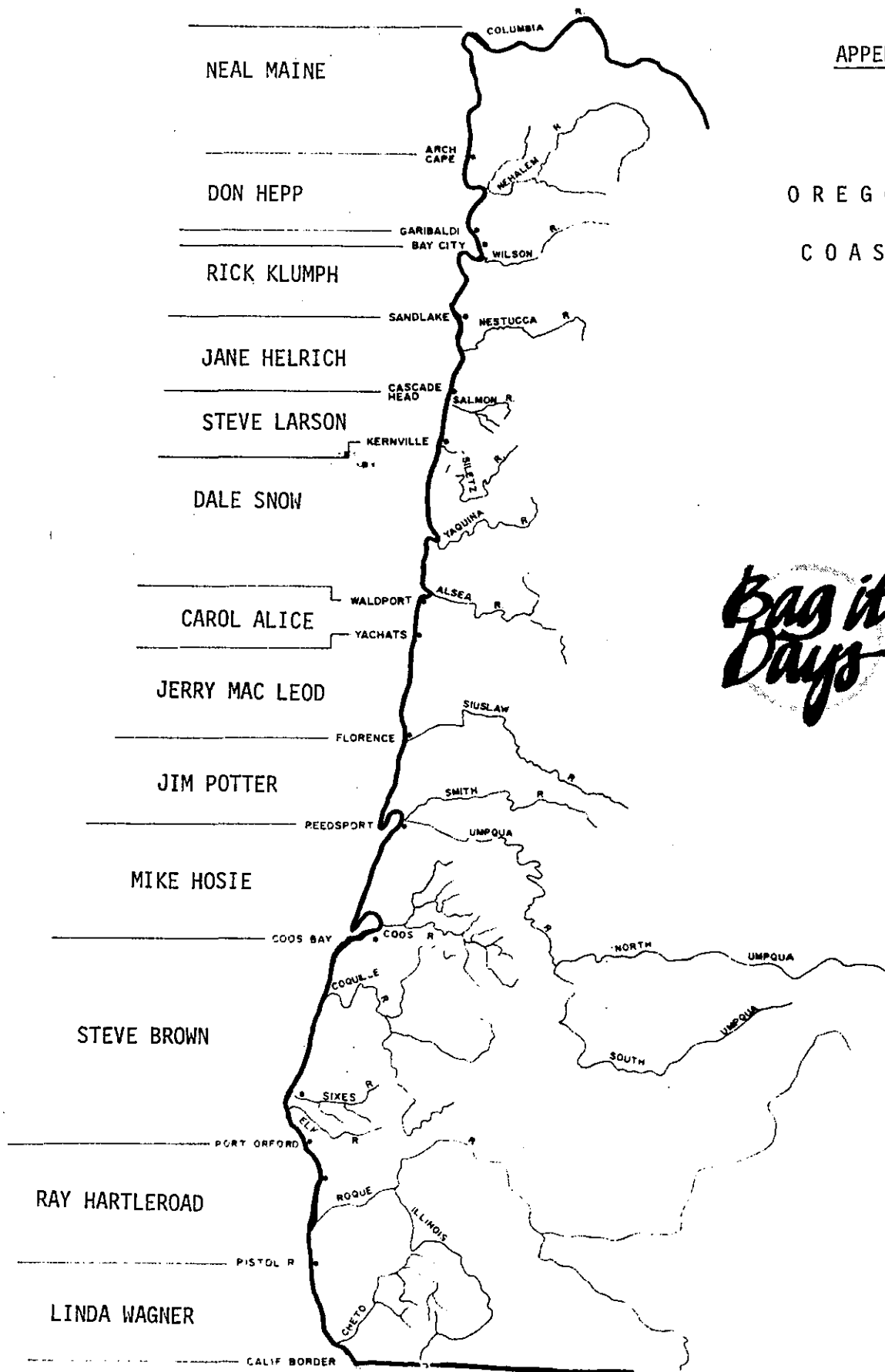


**I Picked Up Plastic
October 13, 1984
And I Get A Free Lunch!**

Printed Courtesy of
Oregon Society of Periodontists

OREGON
COAST

*Bag it
Days*



"GET THE DRIFT AND BAG IT"
ZONE CAPTAINS

SEPTEMBER 21, 1985

APPENDIX II

Oregon 1985 Get the Drift and Bag It Tabulated Results of Cleanup by Zone and Category of Marine Debris

Pieces by Category

| ZONE CAPTAIN | POUNDS COLLECTED | PLASTIC MATERIALS | | | FISHING GEAR | | | STYRO- FOAM | METAL | GLASS | CARD BOARD | PAPER | % OF BEACH USE | % OF OCEAN DRIFT |
|-----------------|---------------------|-------------------|--------------------|-------------------|--------------|------------|--------------|----------------|-------------|-------------|---------------|-------------|----------------------|------------------------|
| | | ROPE | STRAPPING BANDS | SIX-PACK RINGS | RECREATION | GILLNET | CORD WEBBING | | | | | | | |
| MAINE | 5369 | 708 | 291 | 281 | 478 | 146 | 239 | 2405 | 223 | 432 | 215 | 424 | 42 | 40 |
| HEPP | 3023 | 280 | 105 | 137 | 117 | 12 | 78 | 3289 | 186 | 122 | 232 | 355 | 54 | 39 |
| KLUMPH | 3440 | 443 | 274 | 140 | 86 | 55 | 433 | 466 | 209 | 199 | 150 | 504 | 33 | 51 |
| HELDRICH | 2409 | 128 | 69 | 51 | 23 | 15 | 49 | 125 | 91 | 52 | 55 | 62 | 41 | 51 |
| LARSON | 3180 | 402 | 153 | 119 | 53 | 165 | 174 | 1578 | 226 | 780 | 313 | 669 | 60 | 25 |
| SNOW | 4896 | 837 | 712 | 160 | 66 | 45 | 215 | 7584 | 222 | 196 | 111 | 211 | 43 | 45 |
| ALICE | 910 | 106 | 74 | 25 | 12 | 23 | 18 | 210 | 52 | 44 | 21 | 52 | 36 | 34 |
| MAC LEOD | 1175 | 193 | 154 | 52 | 8 | 25 | 56 | 325 | 63 | 96 | 70 | 200 | 60 | 39 |
| POTTER | 2115 | 63 | 48 | 36 | 4 | 11 | 28 | 539 | 41 | 85 | 74 | 329 | 41 | 45 |
| HOSIE | 390 | 114 | 4 | 11 | 3 | 7 | 26 | 1165 | 102 | 114 | 14 | 110 | 51 | 49 |
| BROWN | 2939 | 299 | 114 | 35 | 63 | 56 | 55 | 218 | 80 | 98 | 50 | 15 | 23 | 71 |
| HARTLERODE | 1477 | 50 | 7 | 34 | 3 | 2 | 14 | 440 | 133 | 62 | 76 | 315 | 31 | 41 |
| WAGNER | <u>218</u> | <u>11</u> | <u>14</u> | <u>15</u> | <u>8</u> | <u>2</u> | <u>18</u> | <u>312</u> | <u>56</u> | <u>60</u> | <u>54</u> | <u>121</u> | <u>74</u> | <u>25</u> |
| TOTAL | <u>31541</u> | <u>3634</u> | <u>2019</u> | <u>1096</u> | <u>924</u> | <u>564</u> | <u>1403</u> | <u>18656</u> | <u>1684</u> | <u>2340</u> | <u>1435</u> | <u>3367</u> | <u>43*</u> | <u>42*</u> |

Percentages for origin of debris do not total 100% because not all volunteers estimated beach use or ocean drift.

Questionnaires were received from 85% of the 2300 volunteers. The content of the 85% returned is reflected in the above chart.

*Computer average of data entered.

January 22, 1986